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THE TECHNO-INSTITUTIONAL LEAP AND THE FORMATION OF NEW FIRMS

BY MARTHA GARCIA-MURILLO,* JORGE ANDRES VELEZ-OSPINA,† AND PATRICIA VARGAS-LEON‡

Does the availability of information and communication technologies enhance the ability of entrepreneurs to start up new businesses? Using data from the World Bank and the International Telecommunication Union for all countries over an eleven-year period (2001-2011), the authors test this proposition while controlling for political, economic, and social factors.

INTRODUCTION

Economic activity in the private sector is the lifeblood of a nation. It is through companies' efforts that employment is created, capital investment takes place, and innovation improves the socioeconomic circumstances of a country. Although the scholarly community has debated the benefits of new business to an economy, recent research indicates that start-ups and young businesses are critical for job creation and contribute significantly to a country's net growth. Haitwanger, Jarmin, and Miranda's most recent work confirms this finding, stating that younger firms contribute the most to employment creation,[1] even considering the fact that many of them fail after a few years. They found that even though small, young firms (i.e. firms five years old or less, with fewer than 20 employees) account for only 3% of employment, they account for 20% of gross job creation in the United States. In the European Union, the latest report on small and medium enterprises (SMEs) states that 67% of total employment and 58% of gross value added was created by SMEs.[2] At the international level, a study by Ayyagari, Demirgüc-Kunt, and Maksimovic found that, in a sample of 104 countries, on average, small firms contributed to 16.5% of employment but generated a large

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[1] John Haltiwanger, Ron Jarmin, and Javier Miranda, "Business Formation and Dynamics by Business Age: Results from the New Business Dynamics Statistics," paper presented at the Comparative Analysis of Enterprise Data (CAED) conference, Budapest (2008).
[2] Paul Wymenga, Viera Spanikova, Anthony Barker, Joep Konings, and Erik Canton, "EU SMEs in 2012: At the Crossroads – Annual Report on Small and Medium-Sized Enterprises in the EU, 2011/12," report for the European Commission, Sept. 2012, accessed Nov. 15, 2013, http://ec.europa.eu/enterprise/policies/sme/facts-figures-analysis/performance-review/files/supporting-documents/2012/annual-report_en.pdf.

percentage of jobs (57.8%).[3] Because of these benefits, governments have allocated significant resources to support SMEs. In the United States, for example, the Small Business Act of 1953 mandated the establishment of government-sponsored programs to take care of SMEs' concerns and to improve managerial skills.[4] In Europe, through the Small and Medium-Sized Enterprises Initiative of the Enterprise and Industry Department, the European Commission launched multiple initiatives to support SMEs. The Entrepreneurship 2020 Action Plan, for example, establishes mechanisms to create a favorable environment for entrepreneurs and small businesses, which includes access to finances and training, access to the unified market, participation in procurement, changing the mindset in society to support entrepreneurship and developing best practices among public entities to facilitate the creation of new businesses.[5] In developing nations, SMEs in general, and new businesses in particular, are relatively new policy priorities.

Starting a new business is not easy. Companies need to overcome many challenges, such as access to credit, access to skills, logistical problems, and governmental hurdles, in addition to making sure that there is enough demand for their products or services. However, it is possible that information and communication technologies (ICTs) can lead to a techno-institutional leap, overcoming structural and economic obstacles. The leap may be possible because of the virtuous cycle that ICTs generate. Even though most developing nations are still behind in ICT access, their populations are aware of the Internet and its capabilities.

The main contribution of this article is, therefore, to determine if ICTs have a positive impact on business creation and have the capacity to help business owners overcome deficiencies caused by economic, political, and social factors in the countries where they operate. In the following sections, we review the literature pertaining to the political, economic, social, and technological factors that affect the creation of new businesses. This section is followed by a statistical analysis and finally, some conclusions.

LITERATURE REVIEW: FACTORS THAT AFFECT NEW BUSINESS CREATION

The way new firms affect an economy depends on the socioeconomic and political circumstances they face. These, which altogether we call institutions, determine where individuals put their resources. This can involve productive, unproductive, or destructive activities, depending on the incentives companies

[3] Meghana Ayyagari, Asli Demirgüc-Kunt, and Vojislav Maksimovic, "Small vs. Young Firms Across the World: Contribution to Employment, Job Creation, and Growth," Policy Research Working Paper No. 5631, The World Bank, Apr. 2011, accessed Nov. 15, 2013, http://elibrary.worldbank.org/doi/pdf/10.1596/1813-9450-5631.
[4] Ying Lowrey, "Business Density, Entrepreneurship and Economic Well-Being," working paper, June 2004, accessed Nov. 15, 2013, http://papers.ssrn.com/sol3/papers.cfm?abstract_id=744804.
[5] Commission of the European Communities, "'Think Small First: A 'Small Business Act' for Europe," Communication from the Commission to the Council, the European Parliament, the European Economic and Social Committee and the Committee of the Regions, SEC(2008) 2101-2012, June 25, 2008, accessed Nov. 15, 2013, http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=COM:2008:0394:FIN:EN:PDF.

face.[6] Formal institutions, laws, and regulations, are slow to change. This effect is exacerbated by political and economic interests, as well by institutions' normal inertia and path dependency. Technology, in contrast, changes much faster than formal governing institutions, and because of this, we believe it can help entrepreneurs to start new businesses.

In this article, we suggest the notion of a *techno-institutional leap* to indicate that ICTs have the capacity to help new entrants overcome market and institutional deficiencies. With the emergence of electronic markets and the increasing penetration of the Internet around the world, some of the deficiencies that Khanna and Palepu identify in their book (such as being unable to find buyers and sellers, or having difficulty finding information)[7] can be overcome. Over time, Internet penetration and the familiarity that people now have with the capabilities of these technologies, have made possible the appearance of sites like Deremante ("On Sale") in Latin America, which, although this was not its original intention, provides pricing information on thousands of products and services – information that was previously hidden from the market.

In regard to our definition of *new business*, several authors have indicated there is no agreed-upon international definition for the term.[8] For this article, we use the World Bank's definition, which is the variable we use in the econometric analysis: the number of new limited liability corporations registered in a calendar year, divided by the population size of the country.[9]

We recognize that this variable is problematic for at least two reasons: (1) it does not include the informal sector, which perhaps to a lesser extent contributes to the economy; and (2) LLCs may include spinoffs and joint ventures that are not necessarily new. However, as noted by Klapper et al.[10] and Outcalt,[11] there are no indicators adequate at the worldwide level that can better reflect new business entry.

Political Factors

Political institutions include laws and regulations, the processes that governments adopt to regulate economic activity, and the enforcement of these laws. Kaufmann, Kraay, and Mastruzzi integrate all of these elements in their definition of *governance*, which is "the traditions and institutions by which

[6] Douglass C. North, *Institutions, Institutional Change, and Economic Performance* (Cambridge, U.K.: Cambridge University Press, 1990).
[7] Tarun Khanna and Krishna G. Palepu, *Winning in Emerging Markets: A Road Map for Strategy and Execution* (Boston: Harvard Business School Press, 2010).
[8] Anders N. Hoffmann, "Promoting Entrepreneurship – What Are the Real Policy Challenges for the European Union (EU)?" working paper, unknown date, accessed Nov. 15, 2013, http://capitalism.columbia.edu/files/ccs/CCSWP10_Hoffmann.pdf; Charles Outcalt, "The Notion of Entrepreneurship: Historical and Emerging Issues," working paper, CELCEE Kauffman Center for Entrepreneurial Leadership, Sept. 2000, accessed Nov. 15, 2013, http://aaboori.mshdiau.ac.ir/Announcements/notion%20of%20entrepreneurship.htm.
[9] Leora Klapper, Raphael Amit, Mauro F. Guillén, and Juan Manuel Quesada, "Entrepreneurship and Firm Formation across Countries," World Bank Policy Research Working Paper No. 4313 (2007), accessed Nov. 15, 2013, http://d1c25a6gwz7q5e.cloudfront.net/papers/1345.pdf.
[10] Ibid.
[11] Outcult.

authority in a country is exercised. This includes the process by which governments are selected, monitored and replaced; the capacity of the government to effectively formulate and implement sound policies; and the respect of citizens and the state for the institutions that govern economic and social interactions among them."[12]

In addition to the governance variable (the components of which are explained later in this article) we also include the variables of *bureaucracy*, *size of government*, and the *protection of property rights*. These are all factors that governments, to a certain extent, can influence and that help or impede the rate of business creation.

Governance: Governments can positively or negatively affect the creation of new businesses. It can serve as a *market maker* or *market breaker*, depending on the manner in which it works. Governance is a market maker when it implements an adequate, but not imposing, supervision of credit and labor markets; makes it easy for companies to enter by having streamlined, transparent and predictable processes; supports the creation of knowledge in the country; and adequately enforces laws and regulations. It is a market breaker when it has convoluted or contradictory laws and regulations; complex processes and delays regarding licenses, registrations, and permissions needed by the private sector; and poor implementation and enforcement of laws, which lead to arbitrary decisions that further contribute to uncertainty.

To capture these governance factors and their effects on new businesses, we used the World Bank's governance indicators. A number of the governance variables (e.g. government effectiveness, rule of law, and strength of legal rights) are highly correlated (>.5). This is not surprising given that, to a certain extent, they all reflect different elements of government. Recent research about these indicators has shown that all six of the governance indicators measure the same overall quality of governance.[13] Because of this, previous studies, as well as this one, combine these indicators to create the single average indicator of "governance" that we call the *governance index*.

Given this evidence, we set out to test the following hypothesis:

> **H_1: The higher the governance indicator index, the higher the rate of business creation in a country.**

Bureaucratic Processes: Governments, in an effort to address market failures, pass laws and issue regulations that often become overly complex and lead to confusing and potentially contradictory processes. These procedures are usually set up to serve a particular need or to solve a problem. However, as time passes, some of these procedures become obsolete, but are never eliminated. This leads to the emergence of complex forms, permits, approvals, and so forth, which can take time and jeopardize the capital that a company may have secured to set up a business. It leads to what

[12] Daniel Kaufmann, Aart Kraay, and Massimo Mastruzzi, "The Worldwide Governance Indicators: Methodology and Analytical Issues," World Bank Policy Research Working Paper No. 5430, Sept. 2010, accessed Nov. 15, 2013, http://elibrary.worldbank.org/doi/pdf/10.1596/1813-9450-5430.
[13] Laura Langbein and Stephen Knack, "The Worldwide Governance Indicators: Six, One, or None?" *Journal of Development Studies* 46, no. 2 (2010): 350-370.

Williamson calls "bureaucratic costs,"[14] which affect the dynamism of new ventures.[15] Klapper et al. also discovered that burdensome bureaucratic procedures have driven many individuals to the informal sector.[16]

To capture these government processes, we used proxy variables with data from the World Bank on the *number of procedures and the time required*: (1) *to build a warehouse* and (2) *to register property*. We also included the World Bank's cost of business start-up procedures, which is measured as a percentage of GNI.

Based on the evidence, we set out to test the following hypothesis:

> **H_2: The more complex the bureaucratic procedures are, the lower the rate of business creation in a country.**

Size of Government: In addition to bureaucratic procedures, the size of government may also impair business entry. According to Bjornskov and Foss;[17] Carlsson and Lundström;[18] Gwartney, Lawson, and Holcombe;[19] and Nystrom,[20] large governments can become a barrier for two reasons. First, they may begin to take over more and more functions that could be offered by the private sector. The clearest example is a government's nationalization of businesses. Less obvious is the provision of generous social services that may crowd out private enterprise. The main premise is that large governments are presumed to be providing services that could be provided by the private sector. This limits market and business opportunities for entrepreneurs. Second, as a government becomes more active, it needs to absorb a greater proportion of the resources in the economy and, therefore, competes for inputs with the private sector.[21] This can lead to price increases for key resources that entrepreneurs need – specifically, financial and human capital.

To capture the size of government, we used proxy variables with data from the World Bank on *general government final consumption* and *expenses as cash payments as a percentage of GDP* to measure the operating activities of the government in providing goods and services.

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[14] Oliver E. Williamson, *The Economic Institutions of Capitalism: Firms, Markets, Relational Contracting* (New York: Free Press, 1985).
[15] Ruta Aidis, Saul Estrin, and Tomasz Mickiewicz, "Size Matters: Entrepreneurial Entry and Government," *Small Business Economics* 39, no. 1 (2010): 119-139.
[16] Klapper, Amit, Guillén, and Quesada.
[17] Christian Bjornskov and Nicolai J. Foss, "Economic Freedom and Entrepreneurial Activity: Some Cross-Country Evidence," *Public Choice* 134 (2008): 307-328.
[18] Fredrik Carlsson and Susanna Lundström, "Economic Freedom and Growth: Decomposing the Effects," *Public Choice* 112 (2002): 335-344.
[19] James D. Gwartney, Robert A. Lawson, and Randall G. Holcombe, "Economic Freedom and the Environment for Economic Growth," *Journal of Institutional and Theoretical Economics (JITE)/Zeitschrift für die gesamte Staatswissenschaft* 155 (1999): 643-663.
[20] Kristina Nyström, "The Institutions of Economic Freedom and Entrepreneurship: Evidence from Panel Data," *Public Choice* 136 (2008): 269-282.
[21] Aidis, Esrin, and Mickiewicz, "Size Matters: Entrepreneurial Entry and Government."

Based on the evidence, we set out to test the following hypothesis:

H_3: The bigger the government, the lower the rate of business creation in a country.

Taxation: Several scholars have found a link between taxation and new business creation. For example, a report by the World Bank suggests that the tax rate and the complexity of the taxation regime are factors that can discourage companies from being formally established.[22] Although it is not specifically related to new business, the latest *Doing Business Report* published by the World Bank found that a decrease of 1% of a country's total tax rate was associated with a 1% of GDP increase in investment. Furthermore, a study by Djankov et al. found that a 10% increase in effective corporate tax reduces aggregate investment by 2% and the entry rate by 1.4% points.[23] At the country level, a study by Nashchekina and Timoshenkov found that, in the Ukraine, taxation was the main barrier to business development.[24] Similarly, a study by the World Bank found through a survey that one of the top obstacles to doing business was the tax system; both the bureaucracy around it as well as the tax rate.[25] Several country studies have also found the tax rate to be a major obstacle to entrepreneurship,[26] or to be a significant contributor to the increase of business in the informal sector as opposed to the formal sector.[27]

In regard to business taxation, the World Bank collects two indicators: *taxation on profits* and *other taxation*. In this study, we used *other taxation* because *taxation on profits* had a high percentage of missing data.

Based on the scholarly evidence, we formulated the following hypothesis:

H_4: The higher the other business tax rate, the lower the rate of business creation in a country.

Protection of Property Rights: Another factor that researchers have found that impacts entrepreneurship is the protection of intellectual property rights (IPR).[28] Hodler indicates that a strong

[22] Michael Engelschalk, "Designing a Tax System for Micro and Small Businesses: Guide for Practitioners," working paper, International Finance Corporation/World Bank, Dec. 1, 2012, accessed Nov. 18, 2013, https://www.wbginvestmentclimate.org/uploads/Designing_Tax_Systems.pdf.
[23] Simeon Djankov, Tim Ganser, Caralee McLiesh, Rita Ramalho, and Andrei Shleifer, "The Effect of Corporate Taxes on Investment and Entrepreneurship," *American Economic Journal: Macroeconomics* 2, no. 3 (2010): 31-64.
[24] Olga Nikolayevna Nashchekina and I.V. Timoshenkov, "Hard to Bear, Hard to Measure: The Costs of Small Business Legalization in Ukraine," working paper, International Society for New Institutional Economics (2005); cited in Engelschalk, 9.
[25] Engelschalk.
[26] See for example H. Ade Freeman, F. Ellis, and E. Allison, "Livelihoods and Rural Poverty Reduction in Kenya," *Development Policy Review* 22, no. 2 (2004): 147-171; Ahmet Salik Ikiz, "Shadow Economy in Bulgaria: Small and Medium Enterprises & Tax Evasion," working paper (2002), accessed Nov. 18, 2013, http://www.csd.bg/fileSrc.php?id=10420; M. Yacoub and B. Senchuk, *The State of Small Business in Ukraine: The IFC Survey of Ukrainian Small Enterprises* (Kyiv, Ukraine: International Finance Corporation, 2000).
[27] Friedrich Schneider, "The Shadow Economies of Western Europe," *Economic Affairs* 17, no. 3 (1997): 42.
[28] See for example Douglass C. North and Robert Paul Thomas, *The Rise of the Western World: A New Economic History* (Cambridge, U.K.: Cambridge University Press, 1973); Dani Rodrik, "Institutions for High-Quality Growth: What They Are and How to Acquire Them," *Studies in Comparative International Development* 35, no. 3 (2000): 3-31; Oliver E. Williamson, "The New Institutional Economics: Taking Stock, Looking Ahead," *Journal of Economic Literature* 38 (2000):

regime of property rights is associated with lower levels of government arbitrariness, which facilitates the entry of new businesses.[29] Formalized property rights are important for entrepreneurial activity because they promise the protection of these rights – specifically the exchange of property and the enforcement of contracts. The adequate protection of property rights, as Harper asserts, enhances feelings of personal control and agency, which can promote entrepreneurial activity.[30] Property rights also protect an essential aspect of entrepreneurship, which is the notion of "find and keep" related to elements of the discovery, innovation, and creation of new resources.[31] IPR is even more relevant today because of the emergence of open innovations systems through which companies are able to acquire technology and intellectual property from the outside entities.

Based on the evidence, we set out to test the following hypothesis:

> **H_5: The stronger the protection of property rights, the higher the rate of business creation in a country.**

Figures 1-5 below present graphical representations of political factors, with the dependent variable *business creation*.

Economic Factors

Companies operate in markets, and factors like *income* can affect demand. *Access to credit* can facilitate new business entry, and *competition* can motivate the private sector to be more innovative. In this section, we focus on these three factors, which affect the economic environment in which companies may wish to start a new business.

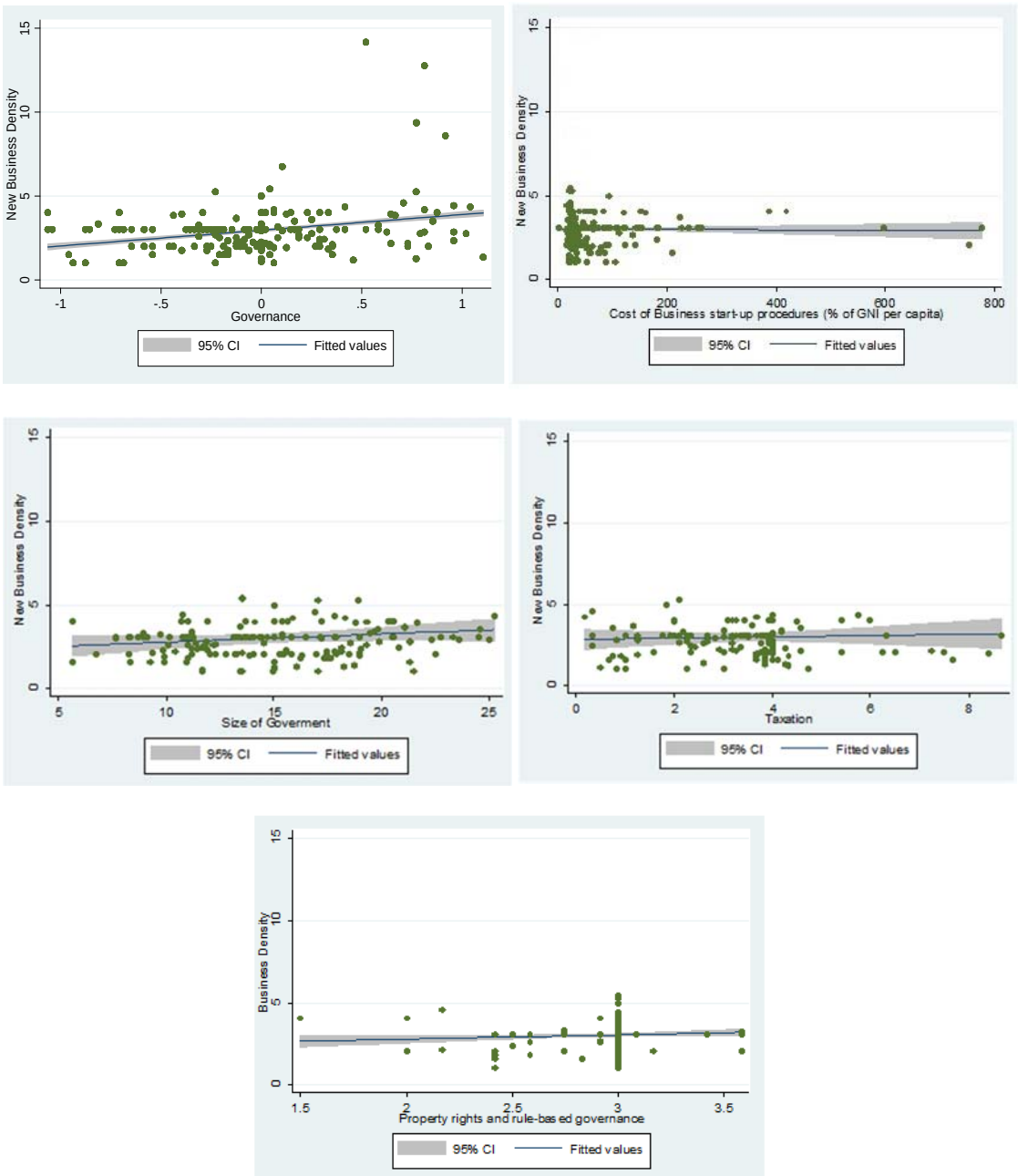
Income: Whether or not wealth affects entrepreneurship is still an issue of scholarly debate. Conventional wisdom holds that wealthy economies should generate more new businesses than poor ones, but the economic literature provides evidence to the contrary.

595-613; Daron Acemoglu and Simon Johnson, "Unbundling Institutions," *Journal of Political Economy* 113 (2005): 949-995.

[29] Roland Hodler, "Industrial Policy in an Imperfect World," *Journal of Development Economics* 90 (2009): 85-93.

[30] David A. Harper, *Foundations of Entrepreneurship and Economic Development* (New York: Routledge, 2003).

[31] Ibid.



Figures 1-5: Raw and fitted values of the relationship between governance factors and new business density

In 1978, Lucas argued that when wages increase as a result of economic growth, the opportunity costs of setting up a business increase,[32] due to the income that an individual has to forgo to set up a business.[33] Thus, scholars argue that the decision of an individual to become an entrepreneur depends

[32] Robert E. Lucas, Jr., "On the Size Distribution of Business Firms," *Bell Journal of Economics* 9 (1978): 508-523.
[33] Richard E. Kihlstrom and Jean-Jacques Laffont, "A General Equilibrium Entrepreneurial Theory of Firm Formation Based on Risk Aversion," *Journal of Political Economy* 87 (1979): 719-748.

on wages. If wages are low, individuals would be more inclined to start their own businesses, with the hope of earning a higher wage than the one that prevails in the market. Consequently, the unemployed should be well suited to starting businesses, as their opportunity costs for self-employment are low. At a more granular level, Hurst et al. found a significant relationship between wealth and entrepreneurship only in the top quintile of the wealth distribution.[34] Evans and Jovanovic also found that wealthier individuals are able to start businesses with more efficient capital levels than poorer individuals.[35] The argument is that sufficient personal income can allow an individual to self-finance a start-up company.

According to Elston and Audretsch, in the absence of personal wealth, government grants, credit cards, and personal wages are the main sources of income for starting a company.[36] In a country with underdeveloped financial markets, only wealthier individuals will be able to set up businesses, because they have the resources to pay for the higher collaterals normally expected in these more uncertain economies.[37] Likewise, in the presence of imperfect financial markets, individuals can borrow only a limited amount of capital, which may limit them from becoming self-employed and oblige them to work for a wage instead.[38]

A country's level of development affects individuals' occupational decisions because it affects the demand and supply of labor.[39] Since wealth has an impact on a person's decision to become an entrepreneur, the distribution of wealth has an impact on entrepreneurship. Some scholars have also argued that with low wages, which are characteristic of recessions, there will be greater motivation to initiate a business. However, during recessions, there are also fewer sources of capital to finance these entrepreneurs. Korosteleva and Mickiewicz argue against the notion of growth during recessions.[40] They expect the opposite – less business creation in times of economic contraction and an expansion of newly established businesses in times of growth.

Given the lack of consensus regarding income, we included the *GDP per capita*, to establish, albeit imperfectly, the average income of the population.

Based on the evidence, we set out to test the following hypothesis:

> **H_6: The higher the income per capita, the higher the rate of business creation in a country.**

[34] Erik Hurst and Annamaria Lusardi, "Liquidity Constraints, Household Wealth, and Entrepreneurship," *Journal of Political Economy* 112 (2004): 319-347.
[35] David S. Evans and Boyan Jovanovic, "An Estimated Model of Entrepreneurial Choice under Liquidity Constraints," *Journal of Political Economy* 97 (1989): 808-827.
[36] Julie Elston and David Audretsch, "Financing the Entrepreneurial Decision: An Empirical Approach Using Experimental Data on Risk Attitudes," *Small Business Economics* 36 (2011): 209-222.
[37] Evans and Jovanovich.
[38] Abhijit V. Banerjee and Andrew F. Newman, "Occupational Choice and the Process of Development," *Journal of Political Economy* 101 (1993): 274-298.
[39] Ibid.
[40] Julia Korosteleva and Tomasz Mickiewicz, "Start-up Financing in the Age of Globalization," *Emerging Markets, Finance and Trade* 47, no. 3 (2011): 23-49.

Access to Credit: Well-developed financial institutions and access to credit enhance entrepreneurial activity in a country.[41] Consequently, several studies have found that a lack of credit is one of the major constraints on those wishing to start a new business.[42] This problem is particularly severe for small firms because of several significant impediments: they are considered riskier because of their lack of a credit history and their high failure rate, and because they require greater monitoring costs.[43] These factors are exacerbated when a country also has a weak legal and financial system that has not yet developed the means to provide credit to these smaller entities.

Developed nations have greater access to credit not only from banks, but also from other sources, such as venture capital, loan guarantee schemes, direct loans to small businesses from government, and financial assistance programs for unemployed individuals who want to start a business.[44] Public-funded support for small and new firms exists in almost all developed countries. These types of programs are not normally available to entrepreneurs in LDCs, as Capelleras, Contín-Pilart, and Larraza-Kintana observe.[45] Venture capital is another important source that authors have found to be significant,[46] but here again, this is mainly available in developed nations.

Given that initial capital may have not come from a bank, we wondered whether there are an equally robust number of companies entering the market in countries with weak financial institutions vs. those with strong ones. If we were to find, for example, that poor financial institutions do not affect the rate at which companies are being formed, this would give an indication of the strength of alternative sources of capital in countries where businesses are able to fill the void caused by the behavior of formal financial companies. The literature finds that there are close relations between the strength of a country's financial institutions and the amount of credit available to the private sector. For the purpose of this study, we included the *amount of domestic credit provided by the banking sector*, which helped us determine the amount of capital available to small companies.

Based on the evidence, we set out to test the following hypothesis:

> **H_7: The higher the amount of capital available from the domestic banking sector, the higher the rate of business creation in a country.**

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[41] Ruta Aidis, Saul Estrin, and Tomasz Mickiewicz, "Institutions and Entrepreneurship Development in Russia: A Comparative Perspective," *Journal of Business Venturing* 23 (2008): 656-672.
[42] Suresh de Mel, David McKenzie, and Christopher Woodruff, "Getting Credit to High Return Microentrepreneurs: The Results of an Information Intervention," *World Bank Economic Review* 25 (2011): 456-485; David Storey, *Understanding the Small Business Sector* (London: Thomson, 1994); Thorsten Beck, Asli Demirgüc-Kunt, and Vojislav Maksimovic, "Financial and Legal Constraints to Growth: Does Firm Size Matter?" *The Journal of Finance* 60 (2005): 137-177; Thorsten Beck, Asli Demirgüç-Kunt, and Vojislav Maksimovic, "Financing Patterns around the World: Are Small Firms Different?" *Journal of Financial Economics* 89 (2008): 467-487.
[43] Elston and Audretsch; Korosteleva and Mickiewicz
[44] Marc Bendick, Jr. and Mary Lou Egan, "Transfer Payment Diversion for Small Business Development: British and French Experience," *Industrial and Labor Relations Review* 40 (1987): 528-542.
[45] Joan-Lluis Capelleras, Ignacio Contín-Pilart, Martin Larraza-Kintana, "Publicly Funded Prestart Support for New Firms: Who Demands It and How It Affects Their Employment Growth," *Environment and Planning C: Government and Policy* 29 (2011): 821-847.
[46] Hoffmann.

Competition from Abroad: National boundaries separate countries' economic policies and institutions. Within these boundaries, governments tend to implement policies to protect their economies.[47] It is therefore not unusual to find policies restricting trade across markets,[48] or bureaucratic procedures that erect barriers to foreign investors.[49] Through trade agreements, governments can regulate commerce and find new opportunities for entrepreneurs beyond their borders.[50] Trade policies open overseas markets for local companies, while also opening the national market to entrepreneurs from other regions.[51] The literature on trade finds two opposing consequences from trade. Trade agreements facilitate the movement of people and goods, and increase the volume of business and the hiring of qualified workers, which is easier than when trade agreements do not exist.[52] The opposite is a potentially negative effect on small local businesses that need to compete with businesses and products from abroad.[53] On this subject, Grossman argues that free trade can have negative effects on developing countries because international competition from more able entrepreneurs inhibits the creation of a local entrepreneurial class.[54]

Even though trade can negatively affect new businesses, trade also exposes the local economy to new technologies from many regions and promotes international competition, driving local firms to increase investment in ICTs.[55] As Globerman and Shapiro indicate, the most successful firms will be those that can offer competitive products and that can change or create strategies, depending on the environment they encounter.[56]

Policymakers believe that trade agreements increase foreign direct investment (FDI), promote the creation of new business, and have a positive impact on the economy; and that countries that sign

[47] Mancur Olson, "Big Bills Left on the Sidewalk: Why Some Nations Are Rich, and Others Poor," Distinguished Lecture on Economics in Government, *Journal of Economic Perspectives* 10, no. 2 (1996): 3-24.
[48] Lowell W. Busenitz, Carolina Gomez, and Jennifer W. Spencer, "Country Institutional Profiles: Unlocking Entrepreneurial Phenomena," *Academy of Management Journal* 43 (2000): 994-1003.
[49] Rashmi Banga, "Impact of Government Policies and Investment Agreements on FDI Inflows," Working Paper No. 116, Indian Council for Research on International Economic Relations, Nov. 2003, accessed Nov. 20. 2013, http://www.icrier.org/pdf/WP116.PDF.
[50] Olson.
[51] Patrick Von Bargen, Doris Freedman, and Erik R. Pages, "The Rise of the Entrepreneurial Society," *Economic Development Quarterly* 17 (2003): 315-324.
[52] Miguel-Angel Galindo Martin, María-Teresa Méndez Picazo, and José-Luis Alfaro Navarro, "Entrepreneurship, Income Distribution and Economic Growth," *International Entrepreneurship and Management Journal* 6 (2010): 131-141.
[53] Ibid.
[54] Gene M. Grossman, "International Trade, Foreign Investment, and the Formation of the Entrepreneurial Class," Working Paper. No. 1174, National Bureau of Economic Research, Aug. 1983, accessed Nov. 20, 2013, http://www.nber.org/papers/w1174.pdf.
[55] Hwan-Joo Seo, Young-Soo Lee, and Jeong-Hun Oh, "Does ICT Investment Widen the Growth Gap?" *Telecommunications Policy* 33 (2009): 422-431.
[56] Steven Globerman and Daniel Shapiro, "The Impact of Government Policies on Foreign Direct Investment: The Canadian Experience," *Journal of International Business Studies* 30 (1999): 513-532.

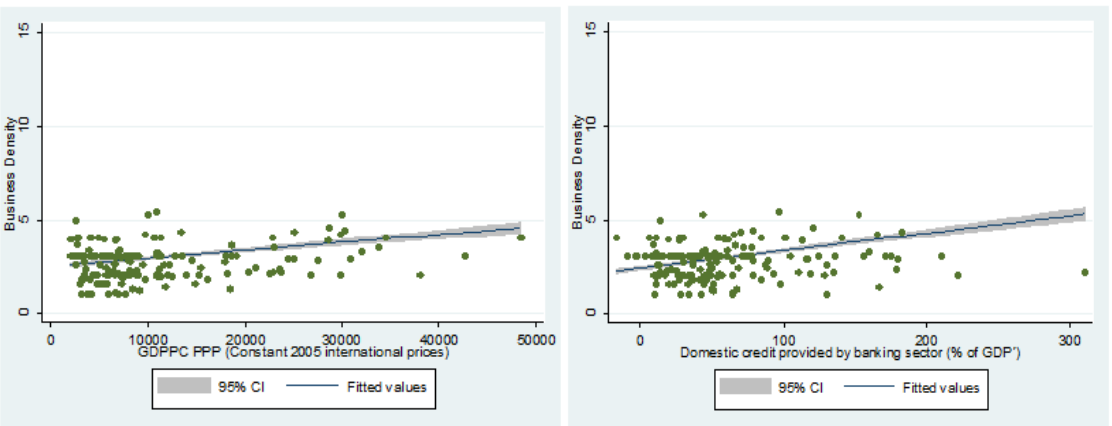
trade agreements are perceived as safe places to start new businesses.[57] However, Bjornskov and Foss did not find any significant relationship between international trade and entrepreneurship.[58]

The freedom to trade internationally is subject to diverse influences, such as taxation on international trade, regulatory trade barriers, the size of the trade sector, official exchange rates, black market exchange rates, and international capital market controls.[59] For the purpose of this paper, we measured the exposure of an economy to trade using the World Bank's *weighted mean of the tariff rate for all products* (%).

Based on the evidence, we set out to test the following hypothesis:

H_8: The lower the tariffs, the higher the rate of business creation in a country.

Figures 6-8 below present graphical representations of economic factors, with the dependent variable *new business density*.



Figures 6-7: Raw and fitted values of the relationship between gross domestic product per capita, domestic credit, and new business density

[57] Raul O'Ryan, Carlos J. de Miguel, Sebastian Miller, and Mauricio Pereira, "The Socioeconomic and Environmental Effects of Free Trade Agreements: A Dynamic CGE Analysis for Chile," *Environment and Development Economics* 16 (2011): 305-327.
[58] Bjornskov and Foss.
[59] Kristina Nyström, "The Institutions of Economic Freedom and Entrepreneurship: Evidence from Panel Data," *Public Choice* 136 (2008): 269-282.

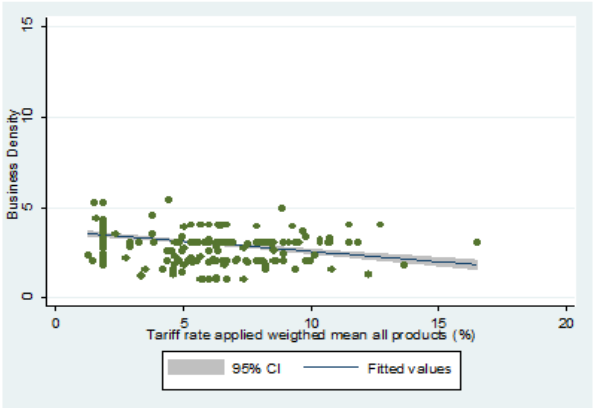


Figure 8: Raw and fitted values of the relationship between trade-related factors and new business density

Social Factors: Education

There are many elements that make up the social fabric of a nation; however, in this section we focus only on education, one of the factors that the literature has found to have an impact on the creation of new business. Schultz conceives of entrepreneurial ability as a form of human capital;[60] and Bianchi and Henrekson further acknowledge that entrepreneurs transform knowledge into viable business opportunities.[61] Entrepreneurs exploit knowledge but also create knowledge. The relationship between education and entrepreneurship has been further recognized by scholars who argue that new ventures are more likely to be found in the vicinity of universities.[62]

It is nonetheless possible that only a minimum level of education is necessary to start a business. There is some anecdotal evidence regarding famous entrepreneurs who dropped out of college to start a business. We could argue that a college education is not necessary, and that perhaps secondary education is sufficient.

Empirical evidence shows that education was the most important factor for new firm creation in the period 1976-1989 in the United States.[63] Le similarly argues that there are several channels through which one's level of education might influence the propensity to become self-employed.[64] In this respect, Calvo and Wellisz explain that one's educational attainment affects the probability of engaging

[60] Theodore W. Schultz, *Investing in People: The Economics of Population Quality* (Berkeley, CA: University of California Press, 1982).
[61] Milo Bianchi and Magnus Henrekson, "Is Neoclassical Economics Still Entrepreneurless?" *Kyklos* 58 (2005): 353-377.
[62] Adam B. Jaffe, "Real Effects of Academic Research," *The American Economic Review* 79 (1989): 957-970; Adam B. Jaffe, Manuel Trajtenberg, and Rebecca Henderson, "Geographic Localization of Knowledge Spillovers as Evidenced by Patent Citations," *The Quarterly Journal of Economics* 108 (Aug. 1993): 577-598; David B. Audretsch and Maryann P. Feldman, "R&D Spillovers and the Geography of Innovation and Production," *The American Economic Review* 86 (1996): 630-640.
[63] Clayton M. Christensen, "The Rigid Disk Drive Industry: A History of Commercial and Technological Turbulence," *The Business History Review* 67 (1993): 531-588.
[64] Anh T. Le, "Empirical Studies of Self-Employment," *Journal of Economic Surveys* 13 (1999): 381-416.

in entrepreneurship; education can enhance managerial ability, which in turn increases the probability of one's becoming an entrepreneur.[65] Figure 9 below presents a graphical representations of the education variable with the dependent variable *new business density*.

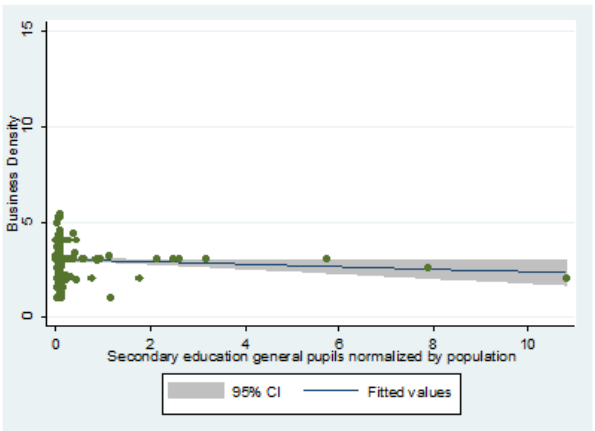


Figure 9: Raw and fitted values of the relationship between education and new business

By analyzing the effect of education on entrepreneurship, we tried to capture the extent to which the education of a population leads to entrepreneurship, or not. Because of a high percentage of missing data on labor force education, we instead used the *number of pupils in secondary education*, adjusted by population size.

Based on the evidence, we set out to test the following hypothesis:

> **H_9: The greater the percentage of educated population, the higher the rate of business creation in a country.**

Technological Factors: ICTs and the Techno-Institutional-Leap

Many factors can affect the technological sophistication of a nation. In regard to the technological base, we focused exclusively on information and communication technologies (ICTs) that are available to the population and that facilitate the exchange of information.

We believe that ICTs have the potential to overcome other economic and social barriers that may be present in a country because of ease of use, expanding access, and the capability that technology has for destroying old social and economic processes to create new ones that are more favorable to economic activity. Today, the barriers to entry for certain businesses have been reduced by the capabilities that ICTs have made possible. There are opportunities for creative individuals to take

[65] Guillermo A. Calvo and Stanislaw Wellisz, "Technology, Entrepreneurs, and Firm Size," *Quarterly Journal of Economics* 95 (1980): 663-677.

advantage of a global market, opened up through innumerable web sites that make goods and services available to individuals at the stroke of a keyboard. It shouldn't be surprising, therefore, to find that the information technology revolution would have an effect similar to that of the Industrial Revolution. As suggested by a number of researchers, in the long run, the Industrial Revolution and the new forms of production that resulted led to major innovations.[66] The same is happening with the Internet Revolution.

The ICT infrastructure of a nation is a key variable in this study because we wished to determine if access to these technologies can help to overcome weaknesses in other areas – what we call the techno-institutional leap. Scholars have identified several technologies that have had a positive effect on businesses: mobile phones (measured as *mobile cellular subscriptions per 100 people*), because they make a person easy to reach anywhere; personal computers (measured here in terms of the *percentage of households owning at least one*), which provide access to information that is now available on the Internet; and the infrastructure to connect these electronic devices, specifically to broadband (measured as the *number of fixed broadband Internet subscribers per 100 people*). These technologies expand the geographic area where goods and services can be bought and sold. Figure 10 below provides a graphical representation of this relationship. The *x* axis shows ICTs, expressed in terms of an index of technological factors that we collected for this research, and the *y* axis shows the business density variable.

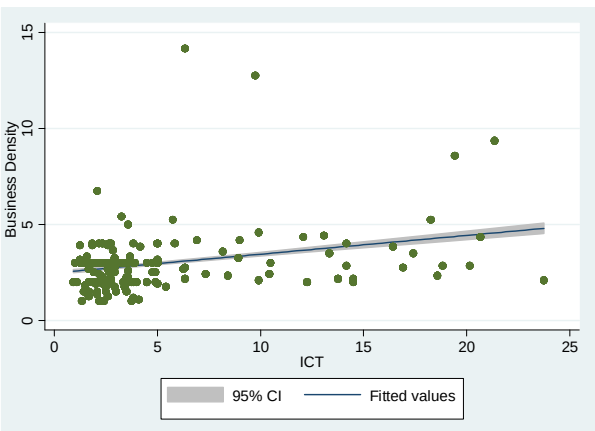


Figure 10: Raw and fitted values of the relationship between ICTs and new business density

It is possible that ICTs make it easier for potential businesses to do the things they need to do to start a company. They can more easily and quickly locate market information and potential suppliers and

[66] See for example R. Millward, "The Emergence of Wage Labor in Early Modern England," *Explorations in Economic History* 18 (1981): 21-39; Douglass C. North, *Structure and Change in Economic History* (New York: W.W. Norton, 1981); Jon S. Cohen, "Managers and Machinery: An Analysis of the Rise of Factory Production," *Australian Economic Papers* 20, no. 36 (1981): 24-41.

buyers, and generate a demand for services. In part, due to the effects mentioned above, ICTs can be a catalyst for overcoming weaknesses in other areas, such as governance, access to credit, education, and so forth. Their contribution materializes in two forms: investment in the deployment of infrastructure and the positive externalities derived from new businesses and economic growth.

For this article, we used data from the International Telecommunication Union to capture the level of ICTs in any given country. Specifically, the variables we chose are: *the number of fixed broadband subscribers per 100 inhabitants*, *the number of mobile subscriptions per 100 inhabitants*, *the percentage of households with a personal computer*, and *the number of Internet security servers* (per million people). In this study, we wanted to determine if ICTs can help overcome some of the institutional voids that exist in some countries. We believe that in the presence of an adequate ICT infrastructure, potential new businesses are able to overcome governance weaknesses.

In light of this, we hypothesized as follows:

> **H_{10}: The greater the access to ICTs, the higher the rate of business creation in a country.**

DATA ANALYSIS

For our data, we relied on two databases from the World Bank (WB) and one from the International Telecommunication Union (ITU). From the WB, we collected data from the World Development Indicators (WDI) and the Worldwide Governance Indicators (WWGI); from the ITU, we consulted its ICT indicators. For each of the variables that come from the World Bank, Appendix 1 presents an abbreviation, a description, the source, the data, and the unit of measurement.

For the dependent variable, we used the World Bank's *business density*, which is measured as the number of new limited liability corporations registered in a calendar year, divided by the population size, divided by 1000, for each country. This metric is of course not perfect, because there are many new businesses that are not registered as limited liability companies. This means that the variable underestimates the number of companies created in a year. Unfortunately, there are no other worldwide variables that are collected systematically over the span of the years treated in this article. Similarly, it is not possible for us to determine the net effect of these factors on business creation because international organizations do not track the number of businesses that leave the market every year.[67]

One of the main challenges when doing empirical international research is coping with missing data (see Appendix 2 for missing statistics). This study is no exception. It has been well documented that analyzing only cases for which there is complete data can lead to biased results. In this study, the initial number of countries in the sample was 213. This was reduced to 189 because many of them were not

[67] This has been a perennial problem in international econometric studies and while many authors have noticed and have called for the collection of this data, it is not yet been done.

countries but territories under another country's jurisdiction, and more countries were eliminated because they had data available for only two or three of the variables chosen for the analysis. The elimination of these countries should not bias the results, because they either had very small economies or were going through major transitions.

This should not imply that we had complete data for all the remaining countries; for some variables, many data points were missing. Appendix 1 presents the list of variables and the number of observations that were available. Data were collected for 11 years (2000-2011) for each of the 170 countries, resulting in a total of 2,039 observations.

Because missing data are a common problem, scholars have devised techniques to calculate values to fill in for them by working from existing variables. In this article, we used a linear trend point that replaces missing values with the linear trend for that point. The existing series is regressed on an index variable scaled from 1 to *n*. Missing values are replaced by their predicted values. The "linear trend at point" method essentially performs a regression where the variable with missing values (the X matrix) is the dependent variable, and the case sequence number is the predictor. Research done on situations involving missing data has found that, in studies using empirical analysis, deleting units from the regression because of lack of data can greatly affect the results. It limits the complexity of possible functional forms and the number of control variables, due to a loss of degrees of freedom.[68] In our case, if we had used only countries with complete data, out of 170 countries we would have lost 117. This stands in contrast to the multiple imputation method we used here, where the imputed data "properly represents all information in a data set in a format more convenient for our standard statistical methods, does not make up any data, and gives accurate estimates of the uncertainty of any resulting inferences."[69]

Table 1 below presents the summary statistics of the data included in the model, by type of factor.

[68] James Honaker and Gary King, "What to Do About Missing Values in Time Series Cross-Section Data," *American Journal of Political Science* 54 (2010): 561-581.
[69] Ibid.

Table 1: Descriptive statistics

Variable	Notation	Mean	Standard Deviation
New business density (dependent variable)	*bdensity*	320.77	345.66
Technological factors			
Fixed broadband Internet subscribers (per 100 people)	*fbiphp*	4.30	7.13
Secure Internet servers (per 1 million people)	*Sis*	123.62	5.60
Percentage of households with a computer	*Hpc*	25.82	22.16
Mobile cellular subscriptions (per 100 people)	*mcsphp*	49.65	40.71
Political factors			
Governance	*governance*	-0.07	0.80
Cost of business start-up procedures (% of GNI per capita)	*cbsup*	75.06	4.73
Procedures to build a warehouse (number)	*pbw*	16.17	6.61
Time required to register a property (days)	*Trrp*	72.71	69.37
General government final consumption expenditure (% of GDP)	*ggfce*	15.81	5.46
Expense (% of GDP)	*egdp*	27.19	12.38
CPIA property rights and rule-based governance rating (1=low; 6=high)	*prrg*	2.89	0.01
Economic factors			
GDPPC.PPP (constant 2005 international $)	*gdppc*	11395.11	12007.61
Domestic credit provided by banking sector (% of GDP)	*dcbs*	61.46	55.48
Tariff rate; applied weighted mean all products (%)	*trap*	6.49	3.94
Other taxes (% of revenue)	*taxes*	3.76	4.57
Social factors			
Secondary education (total number of pupils normalized by total population)	*segp*	0.35	0.04

Table 2 below shows the correlation coefficients for the governance indicators; several inferences can be drawn from these. The governance indicators that we used in this study try to capture what is known as second-level regulatory institutions, which pertains to the day-to-day effectiveness of the government apparatus.[70] There is, however, a relationship between governance and technology. Governments can enhance technological development simply by adopting these innovations or by making commitments to the country's information infrastructure. To address this relationship between technology and governance, we included an interaction term between these two variables.

[70] Saul Estrin and Tomasz Mickiewicz, "Institutions and Female Entrepreneurship," *Small Business Economics* 37 (2011): 397-415.

Table 2: Correlation coefficients for governance variables

	Procedures to build a warehouse (*pbw*)	Time required to register a property (*trrp*)	General government final consumption expenditure (*ggfce*)	Government expenses (% of GDP) (*egdp*)	CPIA property rights and rule-based governance rating (*prrg*)	Cost of business start-up procedures (*cbsup*)	Governance factors (*governance*)
pbw	1.00						
trrp	0.02	1.00					
ggfce	-0.05	-0.01	1.00				
egdp	-0.02	0.03	0.44	1.00			
prrg	-0.05	-0.15	0.11	0.07	1.00		
cbsup	0.00	0.10	-0.11	-0.08	-0.15	1.00	
governance	-0.08	-0.13	0.21	0.20	0.18	-0.14	1.00

Table 3 below shows the correlations among the economic variables. Here, the *GDP per capita* and the *domestic credit available to the private sector* show a high correlation. The impulse to get credit has been found to correlate with domestic demand growth. Studies show a positive correlation between the size of the financial system and long-run economic growth. This positive relationship may be driven by the fact that financial intermediation improves domestic demand via consumption.

Table 3. Correlation coefficients for economic variables

	Tariff rate applied weighted mean all products (%)	GDPPC.PPP (constant 2005 international $)	Other taxes (% of revenue)	Domestic credit provided by banking sector (% of GDP)
	trap	*gdppc*	*othertaxes*	*dcbs*
trap	1			
gdppc	-0.35099	1		
othertaxes	0.008876	0.027259597	1	
dcbs	-0.34664	0.356475859	0.048411681	1

Table 4 below shows the correlations among the technological factors. Among these data, we see a high correlation between the two ICT variables *broadband* and *mobile subscriptions*. It is for this reason that we decided to include *mobile subscriptions* in our instrumental variable model.

Table 4. Correlation coefficients for technological variables

	Fixed broadband Internet subscribers (per 100 people)	Mobile cellular subscriptions (per 100 people)	Percentage of households with a computer	Secure Internet servers (per 1 million people)
	fbiphp	*mcsphp*	*hpc*	*sis*
Fbiphp	1			
mcsphp	0.54	1.00		
Hpc	0.74	0.63	1.00	
Sis	0.56	0.23	0.47	1.00

The high correlations among these variables required us to explore potential multicolinearity problems. To test for this, we calculated the variance inflation factor (VIF), which quantifies the severity of multicolinearity. We adjusted the model based on these results.

The Regression Model

For the statistical analysis, we used the functional form presented in equation (1):

$$nbdensity_{i,t} = \alpha + X'_{it}\beta + u_{i,t} \qquad (1)$$

Where the dependent variable is new business density ($nbdensity_{i,t}$) – the number of new limited liability corporations registered in a calendar year, divided by 1,000 people. In turn, the sample of countries is represented by the subscript i {i = 1,2,3 ... 49}, and {t = 2002, 2001, ..., 2011}, is the time dimension of our data set; a is a scalar, β is a vector of K x 1, and X is the i-th observation of K technological, governmental, economic, and social explanatory variables. Note that the error component takes the form of equation (2):

$$u_{it} = \mu_i + v_{i,t} \qquad (2)$$

In (2), μ_i represents unobservable effects that differ across countries, but not in time (which is usually associated with the ability of each country to create companies), and $v_{i,t}$ represents a purely random error, namely, distributed with zero mean and constant variance, formally represented as $\varepsilon_{i,t} \sim N(0,\sigma^2)$. These effects are time-invariant.

For the i-th cross-section units, the countries in the model, the suggested relationship is expressed in equation (3), which attempts to estimate the effects of these variables on business density:

$$\widetilde{nbrdens}_{i,t} = \alpha + \sum_{k=1}^{K} \beta_{k,} Political_{i,t} + \sum_{k=1}^{K} \beta_k Economy_{i,t} + \sum_{k=1}^{K} \beta_k Social_{i,t} + \sum_{k=1}^{K} \beta_k Technological_{i,t} + \tilde{v}_{it} \qquad (3)$$

Where:

$Political_{t,i}$ = the vector of variables related to the functions of government

$Economy_{i,t}$ = the vector of variables that measure economic factors

$Social_{i,t}$ = the vector of social variables, and

$Technological_{i,t}$ = the vector of technological factors.

The associations between *broadband* and *new business density* reported so far may suffer from an endogeneity bias. The concern is over reverse causality: technological factors may depend on business demand and not the reverse. *Fixed broadband Internet* is endogenous because new businesses need Internet services, and therefore they demand broadband. Because of this demand, Internet providers offer the service. If this is the case, it is not broadband that is causing the creation of new firms. Similarly, in wealthy countries, the demand of the population for new technologies might drive the emergence and diffusion of broadband, rather than broadband leading to higher incomes. If we do not take this reverse causality into consideration, the estimated coefficients are not consistent. In reality, it is likely that causality goes in both directions; therefore, this should be considered in the empirical model by using instrumental variables (see the graphical representation of the model in Figure 11 below). The instrumental variables (IV) estimator provides a way to obtain consistent parameter estimates.

The process assumes that an r x 1 vector of instruments z exists, with $r \geq K$, where: (a) z is uncorrelated with the error u, (b) z is correlated with the vector x, and (c) z is correlated with the regressor vector x.

The procedure also requires that the number of instruments be at least equal to the number of endogenous components, so that $r \geq K$. The model is said to be just-identified if $r = K$.

To address the endogeneity between *fixed-line broadband deployment* and *new business density*, we assumed that broadband penetration is determined by the level of broadband penetration in the previous year, the *number of mobile subscribers*, the *number of households with computers*, and the *number of secure Internet servers*, which we used as a proxy for local content and a lag of the ICT variable with this equation (4):

$$y_{i,t} = \gamma_0 + \gamma_1 y_{i,t-1} + \gamma_2 \text{mcsphp}_{i,t} + \gamma_3 \text{sis}_{i,t} + \gamma_4 hpc_{i,t} + \gamma_5 gdppc_{i,t} + \gamma_6 govict_{i,t} + \varepsilon_{i,t} \quad (4)$$

Where:

$y_{i,t-1}$= a *lag of broadband*

$mcsphp_{i,t}$ = *the number of mobile cellular subscribers*

$sis_{i,t}$ = *the number of secure Internet servers* (per 1 million people)

$hpc_{i,t}$ = *the percentage of households with a computer*

$gdppc_{i,t}$= *gross domestic product* (constant prices)

$govict_{i,t}$= is an interaction term between *governance factors* and *ICTs*

$\varepsilon_{i,t}$ is an error term.

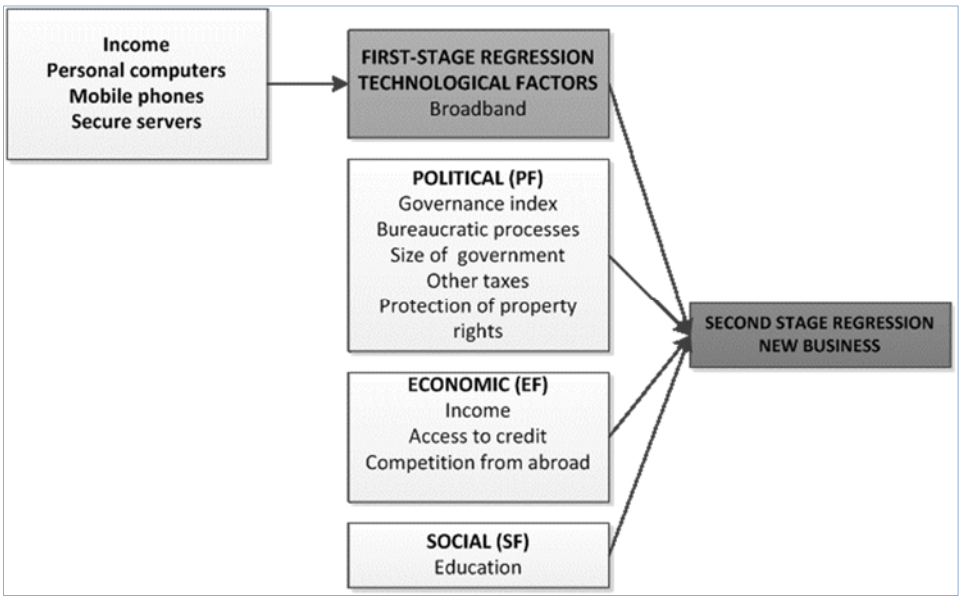


Figure 11: Structural form of the model.[71]

Regression Results

As indicated previously, we estimated the model using a two-stage, fixed-effects regression to deal with the endogeneity problem. The dependent variable is a country's business density. As independent variables, we included a set of social, economic, political, and technological capabilities, and we included the years for which we collected data to capture any time variations.

In the first stage, we modeled broadband adoption being influenced positively by *secure Internet servers* (*sis*), which we used as a proxy for local content; positively with the *percentage of households with a computer* (*hpc*); and negatively with *mobile cellular subscriptions* (per 100 people) (*mcsphp*), due to substitution. The

[71] In Figure 11, technological factors are highlighted to emphasize the focus of this article.

results were all significant, with the expected sign. The intuition behind these instruments is that, first, individuals in high-income countries also have a high capacity to pay for broadband services. Second, state intervention in telecommunications might depend on the level of economic development in a country, thus confounding the effect of sectoral policies with the effect of broadband diffusion. Third, given the rapid technological change in the last two decades, broadband diffusion took place at the same time as the diffusion of other technologies like smart phones and more sophisticated personal computers,[72] making it difficult to capture the specific effect of broadband.

The regression tests also confirmed the validity of our instruments and underlined the causal character of the number of secure Internet servers, mobile subscribers, and computers on broadband infrastructure.[73]

Table 5. Fixed effects regression results: first-stage and second stage.[74]

	Variables	I-First step	II- Second Step
		Broadband	New Business Density
Technological Factors	Fixed broadband Internet subscribers (per 100 people)	-	0.087831*** (0.01584)
	Secure Internet servers (per 1 million people)+	0.005433*** (0.000489)	-
	Percentage of households with a computer+	0.2311075*** (0.008103)	-
	Mobile cellular subscriptions (per 100 people)+	-0.0182941*** (0.005157)	-
Political Factors	Governance index	0.272542 (0.129436)**	0.1371896** (0.067673)
	Cost of business start-up procedures (% of GNI per capita)	0.000467 (0.000408)	0.0000702 (0.000212)
	Procedures to build a warehouse (number)	-0.10502*** (0.022994)	-0.023187** (0.012041)
	Time required to register a property (days)	-0.00423*** (0.001543)	0.0002082 (0.0008084)
	General government final consumption expenditure (% of GDP)	0.1840782*** (0.02778)	-0.026549** (0.014707)
	Expense (% of GDP)	-0.0267547* (0.020218)	0.038696*** (0.010316)
	Other taxes (% of revenue)	0.0000219 (0.040362)	0.0059827 (0.021017)
	CPIA property rights and rule-based governance rating (1=low to high=6)	-0.5347558 (0.345408)	0.0025954 (0.176801)

[72] Diego Comin, Bart Hobijn, and Emile Rovito, "Technology Usage Lags," *Journal of Economic Growth* 13 (2008): 237-256.

[73] All instruments pass the under-identification test, the weak identification test, and the over-identification test. The reader can see this in the last three rows of Table 5.

[74] Note: Standard errors are in parentheses (delta method) ***p<0.01. **p<0.05. *p<0.1.

Economic Factors	GDPPC.PPP (constant 2005 international $)	-0.000486*** (0.0000106)	
	Domestic credit provided by banking sector (% of GDP)	0.026381*** (0.004764)	0.005992 (0.021012)
	Tariff rate applied weighted mean all products (%)	-0.01428 (0.02992)	0.0231748 (0.0152779)
Social Factor	Secondary education general pupils	-0.0129407 (0.052902)	0.0051633 (.0275695)
Time Effects	Year 2001	-1.637092*** (0.367462)	0.1530961 (0.194042)
	Year 2002	0.2721775 (0.376728)	0.1034215 (0.192892)
	Year 2003	1.061352 (0.378252)	0.0293543 (0.191567)
	Year 2004	1.439987*** (0.38382)	-0.162453 (0.191448)
	Year 2005	2.173558*** (0.395309)	-0.168881 (0.195179)
	Year 2006	2.791788*** (0.41489)	-0.168881 (0.195179)
	Year 2007	3.044698*** (0.439586)	0.0480299 (0.1967067)
	Year 2008	3.610039*** (0.467083)	-0.384586** (0.200517)
	Year 2009	3.364021*** (0.490883)	-0.604781*** (0.202438)
	Year 2010	3.442751*** (0.522511)	-0.490328*** (0.205072)
	Year 2011	0.8048316** (0.421643)	-0.200249 (0.196496)
Under-identification test (Anderson canon. corr.)		LM statistic:	692.090 Chi-sq(3) P-val = 0.0000
Weak identification test		Cragg-Donald Wald F statistic) relative bias 16.85 relative bias 10.27 relative bias 6.71 relative bias 5.34 24.58 13.96 10.26 6.31	270.947 5% maximal IV 10% maximal IV 20% maximal IV 30% maximal IV 10% maximal IV size 15% maximal IV size 20% maximal IV size 25% maximal IV size
Over-identification test of all instruments		Sargan statistic	3.345 Chi-sq(2) P-val = 0.3415

Regarding the technological factors – the focus of this article – we found that the broadband variable is significant. The model shows that increases in broadband lead to increases in the creation of new businesses. More concretely, an increase of 1% in the *number of broadband subscribers* per one hundred inhabitants increases *new business creation* by 8.78%. These results support the notion of a techno-institutional leap, whereby countries are able to overcome some institutional impediments when they have access to information technology. However of the other significant variables, the one with the highest impact was *governance* – a 1% improvement in governance can lead to an increase of 13.7 % in the *number of businesses registered*. These results indicate that even though technology is able to overcome many obstacles, the quality of government is crucial for entrepreneurs when they risk entering the market. Of other governance variables included in the model, three more were significant: *the number of procedures to build a warehouse*, and the two variables associated with the size of government. The results thus support the argument that large governments are impinging on the private sector; this is a crowding-out effect, because for every 1% increase in general government consumption, the new business variable drops 2.65%. Similarly, an increase in the number of days it takes to register property reduces business creation density.

The model includes two economic variables: the *domestic credit provided by banking sector* (% of GDP), and the *tariff rate applied weighted mean for all products* (%). Neither was statistically significant. These results support the notion that an entrepreneur can find other sources of funding, or at least it appears so, in the early stages of a venture, when a company has just been founded. Similarly, the factor of whether or not a country is exposed to imports does not affect its level of entrepreneurship.

Of the social variables, we included *secondary education general pupils normalized by population of the country*. The rationale for this is consistent with the literature, which indicates that more educated individuals are more likely to start businesses. The results, however, do not support this hypothesis. It is possible that businesses can emerge without entrepreneurs' needing a high school degree or the equivalent. This, nonetheless, will have to be further explored. An exciting hypothesis would be that even populations with insufficient education can still start businesses. From the perspective of our study, the Internet could also provide enough information to a relatively uneducated population and give them the tools to successfully start businesses.

Figure 12 below shows the results of the significant coefficients for each of the variables in the model for the second-stage regressions. (Appendix 3 shows the results by income level as well.)

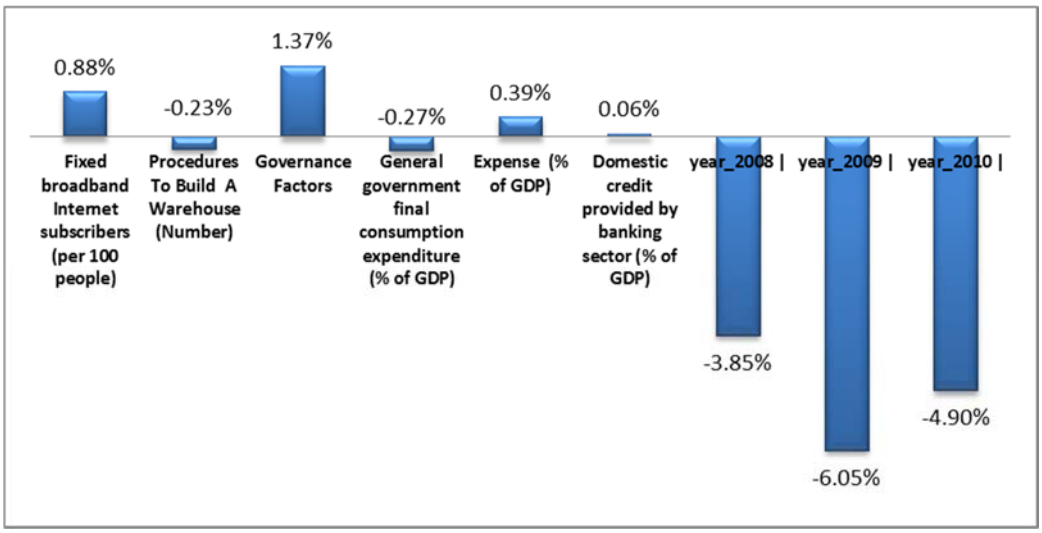


Figure 12: The effects of significant variables on the new business creation model

CONCLUSION

The purpose of this study was to determine whether ICTs play a significant role in promoting business entry. In regard to this, we put forward the notion of a techno-institutional leap. The results support our belief that ICTs have the capability to overcome some deficiencies such as access to funding, education, and even competition from abroad, but not all. Deficiencies related to governance are still a major obstacle to entrepreneurship.

As one could expect, different countries are subject to different governance, economic, political, social, and technological circumstances. The results indicate that of all the factors that impact business entry, governance and broadband, by far, have the capability to support entrepreneurs for countries at most income levels.

In general, the academic literature reports that political, economic, social, and technological factors can affect the level of business entry in a country. In regard to political factors, our empirical analysis, like the literature, supports the notion that poor governance can impair business entry. In regard to economic factors, we found that the availability of credit affects business creation, but the impact is comparatively small. In regard to education, the model did not support the hypothesis that education is significant for business creation in higher-income countries. This result needs to be explored further with more granular data.

Finally, of all of our technological variables, *broadband* was significant and exhibited a high impact. It appears that broadband can play an important role in business. Perhaps the most surprising result is how large the effect of this is, after governance, with respect to the other factors. It appears that governments would be wise to invest in their information infrastructures, because of all the places where they can invest, ICTs have the greatest impact on business creation. We are hopeful that in

spite of the great limitations that governments inadvertently impose on business, ICTs will encourage some individuals to start new business and make governments more efficient.

Further research will be necessary to analyze these data at a higher level of granularity. For example, given that governance continues to be an important factor, it is worth exploring in greater detail the specific factors that affect new businesses and exploring whether the introduction of ICTs into government can further support entrepreneurs. We hope that this research motivates governments to invest in ICTs and improve governance when the desire is to generate economic activity.

APPENDIX 1: DATA DESCRIPTIONS

VN: Variable name **A: Abbreviation** **M: Measure** **S: Source**	**DESCRIPTION**
VM: New businesses registered density A: nbrdens M: number per 10,000 people S: World Bank	This is the number of new limited liability corporations registered in a calendar year, divided by the population size, divided by 1000.
POLITICAL FACTORS	
VN: Governance index M: index (0-1) S: WB Worldwide Governance Indicators	The governance index is the average of the World Bank governance indicators. All these governance indicators give the country's score as an aggregate indicator, in units of a standard normal distribution ranging from approximately -2.5 to 2.5. The indicators that are included in the index are: **Rule of law**: This variable captures perceptions of the extent to which agents have confidence in, and abide by, the rules of society, and in particular estimates the quality of contract enforcement, property rights, the police, and the courts, as well as the likelihood of crime and violence. **Government effectiveness**: This variable captures perceptions of the quality of public services, the quality of the civil service and the degree of its independence from political pressure, the quality of policy formulation and implementation, and the credibility of the government's commitment to such policies. **Voice and accountability**: Captures perceptions of the extent to which a country's citizens are able to participate in selecting their government, as well as the degree of freedom of expression, freedom of association, and freedom of the press. **Political stability and absence of violence**: Captures perceptions of the likelihood that the government will be destabilized or overthrown by unconstitutional or violent means, including politically motivated violence and terrorism. **Regulatory quality**: Captures perceptions of the ability of the government to formulate and implement sound policies and regulations that permit and promote private sector development.
VN: Cost of business start-up procedures A: cbsup M: % of GNI per capita S: WB World Development Indicators	The cost of registering a business is normalized by presenting it as a percentage of gross national income (GNI) per capita.
VN: Procedures to build a warehouse (number) A: pbw M: days S: WB World	The number of interactions of a company's employees or managers with external parties, including government agency staff, public inspectors, notaries, land registry and cadaster staff, and technical experts apart from architects and engineers.
VN: Time required to register property A: trrp M: days S: WB World Development Indicators	The number of calendar days needed for a business to secure rights to property.

General government final consumption expenditure (% of GDP) A= ggfce M: percentage S: WB World Development Indicators	The variable *general government final consumption expenditure* (formerly *general government consumption*) includes all government current expenditures for purchases of goods and services (including compensation of employees). It also includes most expenditures on national defense and security, but excludes government military expenditures that are part of government capital formation.
Government Expense (% of GDP). A= egdp M: percentage S: WB World development indicators	A cash payment for operating activities of the government in providing goods and services. It includes compensation of employees (such as wages and salaries), interest and subsidies, grants, social benefits, and other expenses such as rent and dividends.
Other Taxes A= other taxes M: % of revenue S: WB World Development Indicators	Other taxes include employer payroll or labor taxes, taxes on property, and taxes not allocatable to other categories, such as penalties for late payment or nonpayment of taxes.
Property rights and rule-based governance rating (1=low to high=6) A= prrg	Property rights and rule-based governance assess the extent to which private economic activity is facilitated by an effective legal system and a rule-based governance structure in which property and contract rights are reliably respected and enforced.
ECONOMIC FACTORS	
VN: GDP Per capita A: gdppc M: dollars S: WB World Development Indicators	This variable is based on purchasing power parity (PPP). PPP GDP is the gross domestic product converted to international dollars, using purchasing power parity rates. An international dollar has the same purchasing power over GDP as the U.S. dollar has in the United States. The GDP at purchasers' prices is the sum of the gross value added for all resident producers in the economy, plus any product taxes and minus any subsidies not included in the value of the products. It is calculated without making deductions for the depreciation of fabricated assets or for the depletion and degradation of natural resources. Data are in constant 2005 international dollars.
Domestic credit provided by banking sector (% of GDP) A= dcbs	Includes all credit to various sectors on a gross basis, with the exception of credit to the central government, which is net. The banking sector includes monetary authorities and deposit money banks, as well as other banking institutions for which data are available (including institutions that do not accept transferable deposits but do incur such liabilities as time and savings deposits). Examples of other banking institutions are savings and mortgage loan institutions and building and loan associations.
VN: Tariff rate, applied, simple mean, all products A: trap M: percentage S: WB World Development Indicators	The unweighted average of effectively applied rates for all products subject to tariffs, calculated for all traded goods. Data are classified using the Harmonized System of Trade at the six- or eight-digit level. Tariff line data were matched to Standard International Trade Classification (SITC) Revision 3 codes to define commodity groups. Effectively applied tariff rates at the six- and eight-digit product level were averaged for products in each commodity group. When the effectively applied rate was unavailable, the most favored nation rate was used instead. To the extent possible, specific rates have been converted to their *ad valorem* equivalent rates and have been included in the calculation of simple mean tariffs.
SOCIAL FACTORS	
Secondary education, general pupils A: segp M: per total population S: WB World Development Indicators	The number of secondary students enrolled in general education programs, including teacher training.

TECHNOLOGIAL FACTORS	
VN: Fixed broadband Internet A: fbisphp M: subscribers per 100 people S: ITU ICTs Indicators	The percentage of fixed broadband Internet subscribers possessing a digital subscriber line, cable modem, or other high-speed technology.
Secure Internet servers A= sis M= per 1 million people S: WB World Development Indicators	Secure servers are those using encryption technology in Internet transactions.
Percentage of households with a computer A= hpc M = Percentage S: ITU ICTs Indicators	This refers to the total number of computers available in the country's households.
VN: Mobile cellular A: mcsphp M: subscribers per 100 people S: ITU ICTs Indicators	This is the percentage of the population subscribing to a public mobile telephone service using cellular technology that provides access to the public switched telephone network. Post-paid and prepaid subscriptions are included.

APPENDIX 2: MISSING DATA STATISTICS

Variable	No. of replaced missing values	%	Variable	No. of replaced missing values	%
New businesses	1487	73%	General government final consumption expenditure (% of GDP)	367	18%
Procedures to build a warehouse (number)	918	45%	Government expenses (% of GDP)	1058	52%
Time required to register a property (days)	783	38%	Property rights	1568	77%
Tariff rate, applied, weighted mean, all products (%)	842	41%	Domestic credit provided by banking sector (% of GDP)	182	9%
Other taxes (% of revenue)	1064	0.52%	Secondary education, general pupils	426	21%
Governance index	435	21%	New business density (new registrations per 1,000 people ages 15-64)	1475	72%
gdppc,ppp (constant 2005 international $)	486	24%	Secure Internet servers (per 1 million people)	543	27%
population, total	259	13%	Mobile cellular subscriptions (per 100 people)	270	13%
time required to build a warehouse (days)	918	45%	Personal computers (per 100 people)	1723	84%
fixed broadband Internet subscribers (per 100 people)	426	21%			

APPENDIX 3: NEW BUSINESS MODEL

Variable	G1 High income: OECD	G2 High income: non-OECD	G3 Upper middle income	G4 Lower middle income	G5 Lower income
Fixed broadband Internet subscribers (per 100 people)	-0.0420561 (.0539965)	0.4002784*** (0.1468549)	0.0156257 (0.0399586)	0.0292764 (0.052124)	-0.0560844 (0.0451325)
Cost of business start-up procedures (% of GNI per capita)	0.005907 (0.0181743)	0.0003866 (0.0020215)	-0.00008 (0.0009524)	0.0033985** (0.0015811)	0.0001999 (0.0001462)
Procedures to build a warehouse (number)	-0.0761586** (0.0422331)	-0.037452 (0.1064755)	0.0232406 (0.0187518)	-0.0474064*** (0.0127497)	0.0101371 (0.0138)
Time required to register a property (days)	-0.0057543* (0.0422331)	0.0014348 (0.0032992)	0.0032842** (0.001597)	0.0007995 (0.0011775)	0.0014508** (0.0008127)
Governance index	1.114683** (0.577648)	-0.0260538 (0.4604271)	0.1242681 (0.0869875)	0.020799 (0.0616441)	0.1954746 (0.1258533)
General government final consumption expenditure (% of GDP)	-0.0415295 (0.0979659)	0.0888652 (0.1085504)	0.012025 (0.027423)	0.005892 (0.0159596)	0.0073864 (0.0133491)
Domestic credit provided by banking sector (% of GDP)	0.0292141*** (0.0057015)	-0.0362649*** (0.0159225)	0.0109919*** (0.0048451)	-0.0023062 (0.0036709)	-0.0032861 (0.0030902)
Tariff rate applied weighted mean all products (%)	0.1929004 (0.1388025)	-0.0299958 (0.1576745)	0.0126362 (0.023258)	0.030819*** (0.0140238)	0.0052607 (0.0187551)
Other taxes (% of revenue)	-0.0392652 (0.1005896)	0.0034953 (0.0925529)	-0.0298425 (0.0304591)	-0.0091028 (0.0210336)	-0.009805 (0.0442083)
Secondary education general pupils	0.0372984 (0.5323187)	-0.4816212 (0.6283598)	0.0063663 (0.0338762)	0.0100473 (0.020243)	0.0396877 (0.142286)
Number of obs	**330**	**164**	**495**	**506**	**374**
Centered R-sq	**0.1987**	**0.2191**	**0.10**	**0.2792**	**0.08**

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